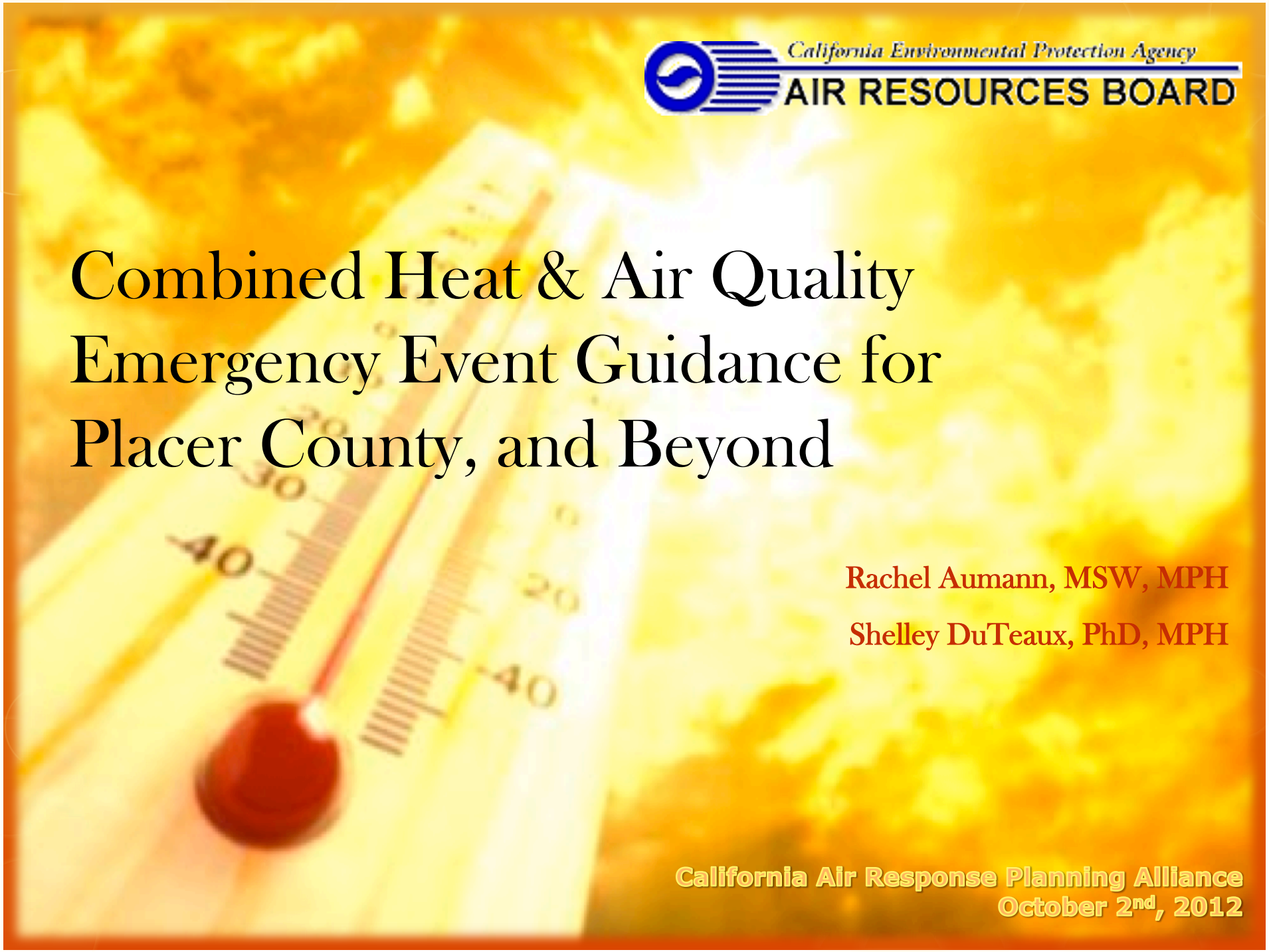


Combined Heat & Air Quality Emergency Event Guidance for Placer County, and Beyond

Rachel Aumann, MSW, MPH

Shelley DuTeaux, PhD, MPH

California Air Response Planning Alliance
October 2nd, 2012

The Big Picture

Scientific question: When heat, ozone and $PM_{2.5}$ are present at elevated levels at the same time, is their effect on human health additive or synergistic?

Public Health question: When these elements are present together do local communities have the capacity to protect human health?

Terms

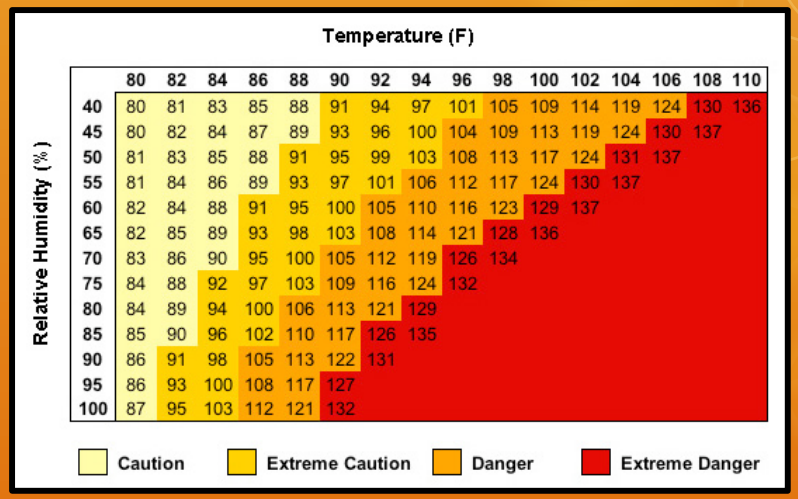
I was concerned with…

- **Heat-**measured by the Heat Index

- **Ozone or 0_3**

- **Fine particulate matter or $PM_{2.5}$**

Both measured by the AQI



Temperature (F) / Relative Humidity (%)	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	113	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	117	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	128	136					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

Air Quality Index Levels of Health Concern	Numerical Value	Meaning
Good	0 to 50	Air quality is considered satisfactory, and air pollution poses little or no risk
Moderate	51 to 100	Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people who are unusually sensitive to air pollution.
Unhealthy for Sensitive Groups	101 to 150	Members of sensitive groups may experience health effects. The general public is not likely to be affected.
Unhealthy	151 to 200	Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects.
Very Unhealthy	201 to 300	Health warnings of emergency conditions. The entire population is more likely to be affected.
Hazardous	301 to 500	Health alert: everyone may experience more serious health effects

Public Health Burden-Ozone

Human Health

Coughing, wheezing, throat irritation, tightness in chest, trouble breathing, fatigue

All above + increased risk of asthma attacks and cardiac arrest and death

At-risk Groups

Young children, the elderly, outdoor exercisers.
Individuals with: asthma, respiratory or cardiovascular disease, outdoor occupations

Mortality

4700 excess deaths nationwide in 2005 attributable to poor air quality due to ozone

Acute effects

Public Health Burden-PM2.5

Human Health

Lung irritation, coughing, wheezing, decreased lung function, lung damage (chronic exposure)

All above + exacerbated asthma symptoms/attacks, can induce cardiac arrest and death

At-risk Groups

Young children, elderly, people exercising or working outdoors near roadways.
Individuals with: compromised lung function (asthma), cardiovascular disease

Mortality

In 2005 130,000 excess deaths resulted nationwide from poor air quality due to $PM_{2.5}$

Acute or lag effects

Public Health Burden-Heat

Human Health

Heat stress, heat exhaustion, heat stroke, death

Heavily dependent upon: regional acclimation, activity level, humidity, health condition

At-risk Groups

Young children, the elderly, homeless and others w/o A/C; ag, construction & other outdoor workers and those exercising outdoors. Individuals with: diabetes, cardiovascular, respiratory or renal disease, obese individuals

Mortality

CA heat wave of 2006 resulted in 140 deaths directly attributable to heat; another 600+ linked to heat

1999-2003 3400+ deaths attributable to heat in the U.S.

40% over age 65

Cardiovascular disease underlying in 57%

Access to A/C

Why This Project?

Wildfires and heat waves of 2008

The public health community in Placer County felt ill-prepared to address health concerns

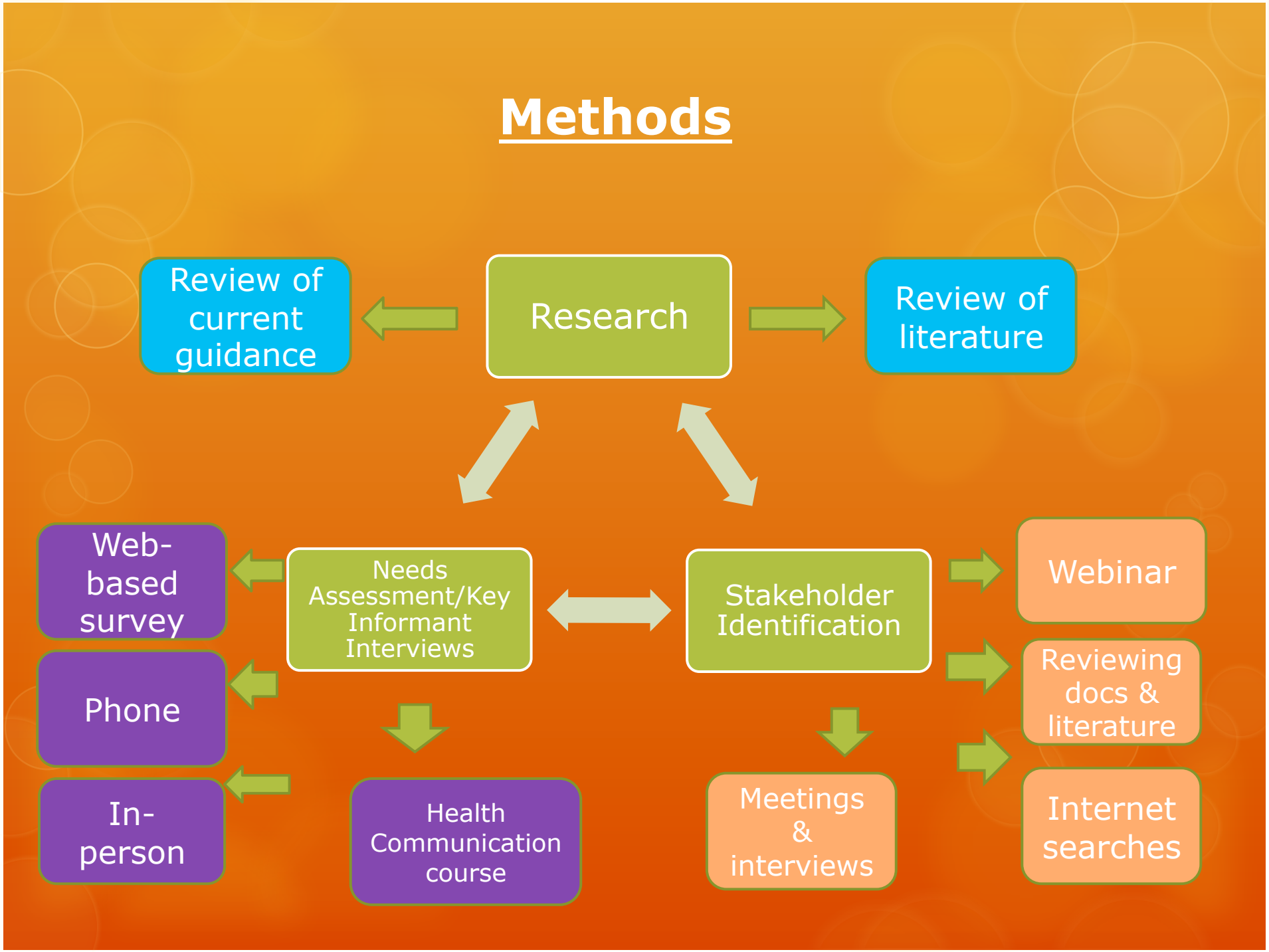
For example: “Do we cancel athletic practice?”

Other local communities feel similarly

Placer County elevated this concern to the California Air Response Planning Alliance

Air Resources Board picked up project

Methods


Review of current guidance
Research
Review of literature
Web-based survey
Phone
In-person
Needs Assessment/Key Informant Interviews
Health Communication course
Stakeholder Identification
Meetings & interviews
Webinar
Reviewing docs & literature
Internet searches

The Stakeholders

Professional Community

National Weather Service

CDPH

Air Pollution Control Districts

Physicans and other healthcare providers

Air Pollution Specialists

Epidemiologists

Health Educators

Community Stakeholders

Placer County Office of Education

School Districts

Day care providers

Elderly care facilities/caregivers

Coaches

Faith-based communities

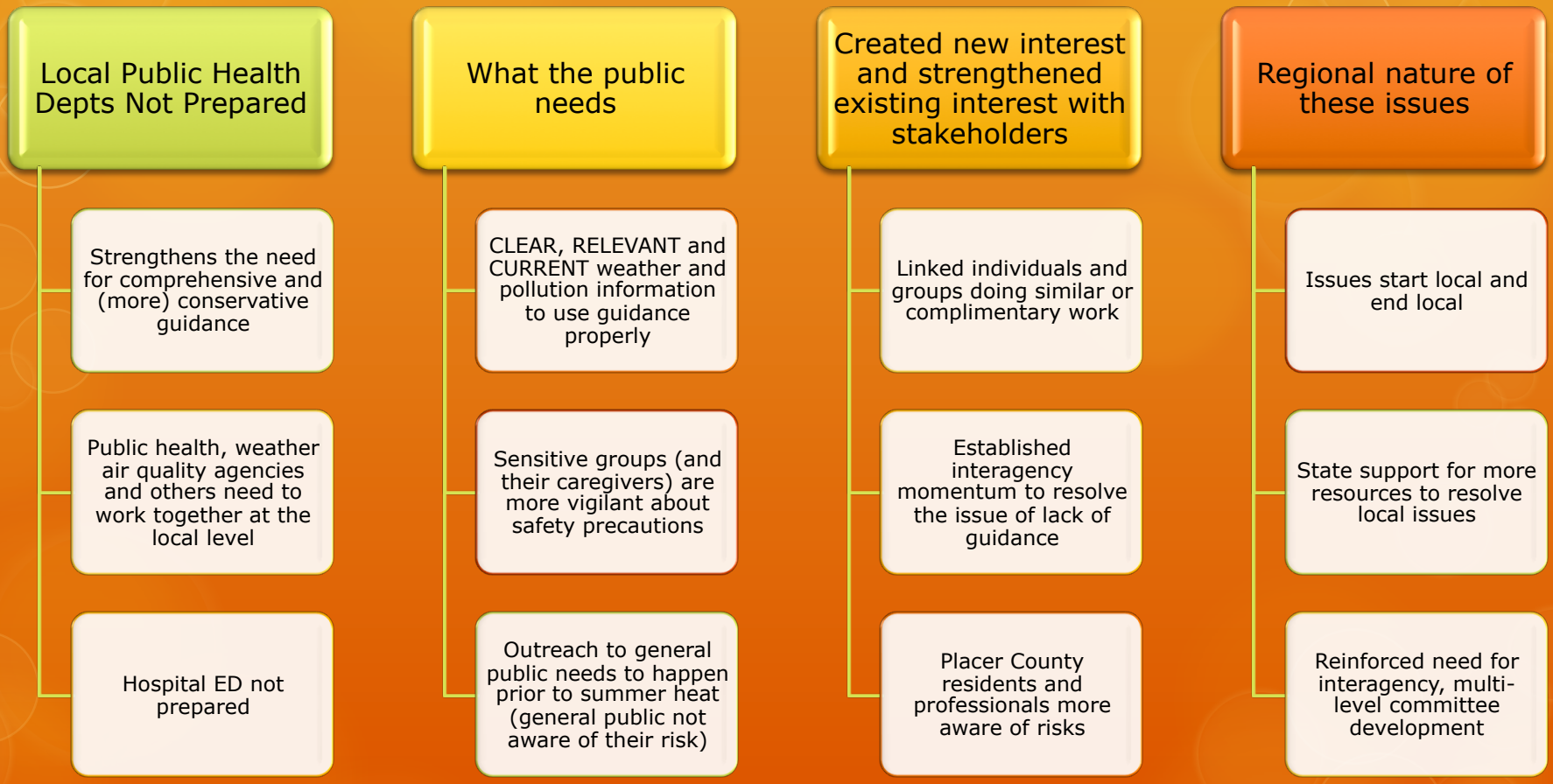
Tribal Communities

Placer County Office of Ed-Survey

- Does your school have a plan for when temperatures are elevated? When air quality is poor?
- Have you seen an increase in chronic conditions?
- What source of information do you currently use?

- Mostly, yes
- Nearly all reported a significant increase in asthma cases and severity of those cases
- Local air alerts and media sources

Lessons Learned



"Will I be effected?"

"What do I need to do right now?"

The Template-Matrix Side

Combined Heat & Air Quality (PM2.5 and Ozone) Guidance for Outdoor Activity Decision-Making

Temp (F°)	Good (0-50)	Moderate (51-100)	Unhealthy for Sensitive Groups* (101-150)	Unhealthy for Everyone (151-200)	Very Unhealthy for Everyone (201-300)
75 or below	No restrictions	No restrictions	Provide equally active space indoors for sensitive individuals	Provide equally active space indoors for everyone or limit activity to early morning. Keep windows and doors closed.	Provide equally active space indoors for everyone. Keep windows and doors closed at all times.
76-84	No restrictions	Provide shade and hydration	Provide equally active space indoors for sensitive individuals and hydration	Provide equally active space indoors with A/C for everyone or limit activity to early morning. Provide hydration. Keep windows and doors closed.	Provide equally active space indoors with A/C for everyone. Provide hydration. Keep windows and doors closed at all times.
85-90	Provide shade and hydration for everyone	Provide shade and hydration for everyone or limit activity to morning hours	Provide equally active space indoors with A/C for sensitive individuals and offer this space to everyone; provide hydration	Provide equally active space indoors with A/C for everyone. Provide hydration. Keep windows and doors closed.	Provide equally active space indoors with A/C for everyone. Provide hydration. Keep windows and doors closed at all times.
91-99	Exercise indoors with A/C and provide hydration	Exercise indoors with A/C and provide hydration. Keep windows and doors closed.	Limit outdoor activity to morning hours or provide equally active space indoors with A/C and hydration for everyone. Keep windows and doors closed.	Provide equally active space indoors with A/C for everyone. Provide hydration frequently. Keep windows and doors closed.	Provide equally active space indoors with A/C for everyone. Provide hydration frequently. Keep windows and doors closed at all times.
100+	Exercise indoors with A/C and provide hydration	Exercise indoors with A/C and provide hydration. Keep windows and doors closed.	Provide equally active space indoors with A/C for everyone. Provide hydration frequently. Keep windows and doors closed.	Provide equally active space indoors with A/C for everyone. Provide hydration frequently. Keep windows and doors closed at all times.	Provide equally active space indoors with A/C for everyone and limit this activity for morning hours. Keep windows and doors closed at all times.

The Template-Instructional Side

Combined Heat & Air Quality (PM2.5 and Ozone) Guidance for Outdoor Activity Decision-Making

***Sensitive groups:** An individual meeting any of the following criteria is considered at greater risk to exposure to heat and poor air quality and should adhere to the guidelines for "sensitive groups" in order to avoid exacerbation of symptoms or other adverse health effects.

- Children (0-18)
- Age 65 or older
- Asthma or other respiratory illness
- Cardiovascular disease
- Renal Disease
- Diabetes (Type I or II)
- Obesity
- Severe mental illness
- Otherwise healthy individuals who are exercising strenuously outdoors or working an outdoor occupation (construction, agriculture, road work, etc.) are at increased risk due to the nature of their outdoor activity.

What is PM2.5? $PM_{2.5}$, or fine particulate matter, is any pollutant measuring less than 2.5 micrometers in diameter, 100 times smaller than a human hair. These particles can get deep into the lungs causing difficulty breathing, especially for people with asthma. Wildfires and pollution from cars, trucks and factories are large contributors of $PM_{2.5}$.

What is Ozone? Ozone, at ground-level, is formed when pollutants, such as from cars, trucks, factories, or even wildfires, reacts with sunlight. Ozone is highly reactive inside the body, meaning it can cause immediate harm when inhaled, especially for individuals with asthma or cardiovascular disease. Ozone can get deep into the lungs where the most damage is likely to occur.

Purpose of this guidance document

To provide guidance when temperatures are elevated and air quality is poor. For example: how to protect children during a combined wildfire and heat wave event while still maintaining regular physical education.

How to use this document

It is necessary to check **current** weather and air quality conditions. Fortunately, checking both can be done quickly and conveniently.

To check air quality (both Ozone and $PM_{2.5}$):

Go to Airnow.gov
Type in your zip code
Read the numerical values associated with ozone and $PM_{2.5}$ under "**Current Conditions". Using the higher of the two values,** match the numerical value or the corresponding color with the column heading on the template (for instance, if the highest value is for ozone at 151, then match with the column reading 151-200 on the template, which is "Orange" for "Unhealthy for Sensitive Groups").

To check current weather conditions: Use your iPhone or other smartphone weather app; weather.com; weather channel; or call your local weather station.

Putting it all together: Match the temperature row with the air quality column to find the recommendations for the current outdoors conditions.

Other important resource links

Wildfire Smoke Guide

Cal E.M.A. California Contingency Plan for Excessive Heat

Recommendations for Schools and Others (for Ozone only)

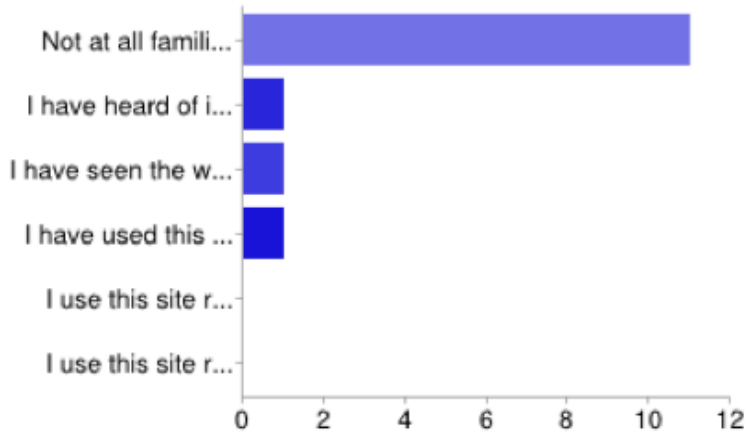
What is $PM_{2.5}$?

What is Ozone?

Information on heat-related illness

The Evaluation

Prior to receiving the guidance tool, how familiar were you with Airnow.gov?



Not at all familiar/Never heard of it before

I have heard of it before but I never went to the website

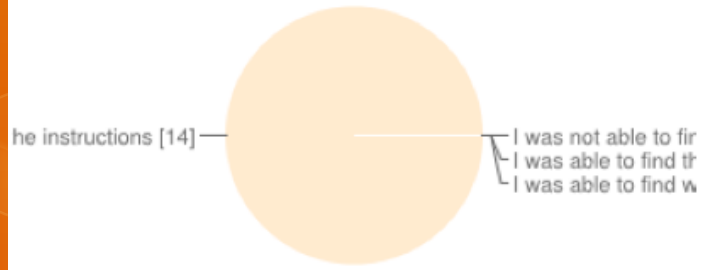
I have seen the website but did not use it

I have used this site several times to look up local air quality information

I use this site regularly to look up local air quality information for personal use

I use this site regulatly to look up air quality information as part of my job

Based soley on the instructions provided on the guidance template (and not any previous knowledge you may have of Airnow.gov), were you able to look up the PM2.5 in your region?



I was not able to find the website using the instructions

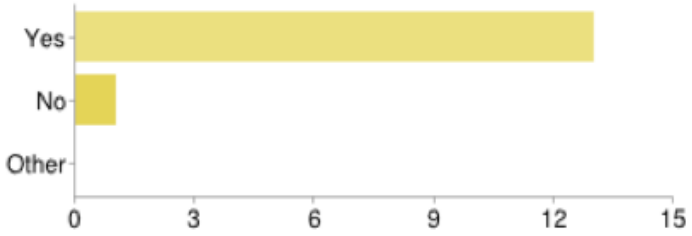
I was able to find the website but could not find where to put in my local information using the instructior

I was able to find where to enter my local information but did not understand how to read the forecast ba

I was able to find the current forecast for ozone and PM2.5 for my location based on the instructions

The Evaluation-Continued

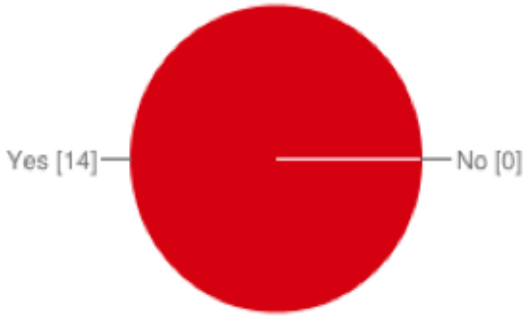
Would you use this website again based on your experience using the template instructions?



Yes	**13**
No	**1**
Other	**0**

People may select more than one checkbox, so percentages may add up to more than 100%.

Would you recommend this template to others?



Yes	**14**
No	**0**

Next Steps

Make research database available to public and researchers

Recommend interagency committee formation to finish process

Make formal recommendation to Placer County to adopt combined heat and air quality guidance

Make formal recommendation for Wildfire Smoke Guide and California Contingency Plan for Excessive Heat to include combined guidance

Policy Brief to ARB

Call to Action For Public Health

September 2012

RACHEL AUMANN, MSW, MPH

UNIVERSITY OF CALIFORNIA, DAVIS

Combined Heat & Air Quality Event Guidance for Public Health Decision-making

Executive Summary

California does not have guidance for public health decision-making for days when temperatures are elevated and air quality is poor due to high concentrations of fine particulate matter and/or ground-level ozone. In California, wildfires are a large contributor to poor air quality. These wildfires overwhelming occur during the heat of summer, making a combined heatwave and wildfire event likely.

We know that heat alone causes a range of heat-related illnesses, from heat cramps to heat stroke, which can quickly lead to death. Such was the case during the Southern California heatwave of 2006, where 140 deaths were directly attributable to the heat, with another 600 or more excess deaths linked to the heat.

We also know that exposure to fine particulates and ozone wrecks havoc on the human body, especially in individuals with respiratory or cardiovascular disease. Both pollutants can get deep into the lungs causing: difficulty breathing; wheezing; exacerbated disease symptomology; fatigue; and even death. A recent Cal EPA report noted that 9,000 excess deaths annually were caused by exposure to fine particulates. The 2007 Southern California wildfires saw a significant increase in asthma-related and dyspnea-related emergency department visits (21.7 to 40.4 per day and 48.6 to 72.6 per day, respectively). If heat and pollutants can cause such harm independently, imagine what harm they do when in combination. Is it additive? Is it synergistic?

Californians and local public health professionals look to the Air Resources Board and other state agencies to take the lead in developing public health protections. Local jurisdictions can provide guidance to their citizens once guidance has been established, but many of these localities lack the financial and personnel resources required to develop their own guidance. The state has an obligation to support local jurisdictions in making protective public health decisions for their citizens.

A comprehensive needs assessment involving local residents and public health officials in Placer County, along with key informant interviews with profesionals from across the state, strongly suggests combined heat and air quality event guidance is needed. We cannot wait for the additive versus synergistic question to be answered. The California Air Resources Board must convene an interagency working group to formalize the combined guidance I have started to develop. This action needs to happen immediately.

Facts to Consider

From 1999-2003, more than 3,400 deaths were directly attributable to heat nationwide

54% of these deaths occurred in people with cardiovascular disease

34% occurred in people over age 65

9,000 excess deaths occur annually due to exposure to fine particulates

Ozone exposure will lead to 4,700 deaths over the next few years if levels remain as high as they were in 2005

With climate change California is projected to experience more heat waves and of longer duration

Increased temperatures year-round leads to a higher wildfire threat during the summer months

Problem Statement

California lacks guidance for public health decision-making regarding combined elevated heat and poor air quality event days. The California Air Resources Board (CARB) can aid the development of the combined heat and air quality guidance by taking a leadership role to convene an interagency working group. CARB should take a primary leadership role because Californians look to this agency to protect their health concerning poor air quality. Given that heat goes a long way to increase poor air quality, by way of aiding in wildfire hazard and ozone pollution, heat and air quality issues are intrinsically connected.

The person primarily responsible for monitoring the activities of the interagency workgroup should be someone with interagency collaboration inherent to their role at CARB. This person should take the lead in identifying the most qualified professionals from partnering state and local agencies. This selection process should happen immediately while the heat and wildfires of this current summer season are still vivid in our minds.

US EPA Air Quality Specialist, Susan L. Stone, along with local air district staff should be strongly considered as members or consultants to this working group. Dr. Helene Margolis should be consulted for her expertise in heat and also air pollution-related epidemiological evidence. Dr. Michael Lipsett, of the California Department of Public Health should be consulted for the work he did with the Wildfire Smoke Guide. Finally, David Reynolds of the National Weather Service should be consulted for his expertise in weather-related issues as well as for his connections to a host of local National Weather Service office personnel.

Background

The California heat wave of 2006 directly killed 140 people, with another 600 excess deaths associated with the heat. In Northern California, the combined heat waves and wildfires of 2008 left residents and public health professionals worried that the guidance available to them was not conservative enough to protect against the heat and wildfire smoke. They were being heavily inundated with both, and for a long duration.

The 2007 Southern California wildfires drastically increased emergency department visits for asthma and other chronic conditions. Countless heat wave and wildfire incidents send countless numbers of otherwise healthy people to the emergency room every year. Those with asthma, cardiovascular disease, children, the elderly and those with diabetes, mental illness, obesity and other chronic conditions are at increased risk for harm from heat and air pollution and go to the emergency room or are hospitalized at even higher rates than the general health public.

It is important to note that otherwise healthy children and adults are at increased risk of illness and even death due to heat or air pollution when their work or recreation takes them outdoors during high temperatures or poor air quality days. The public is generally unaware of their risk during such events so efforts must be made to educate the entire community about their individual risks given: health, age and activity-level (or occupational hazards).

Statement of my interest in resolving this problem

As a California resident and as a public health professional, I am interested in establishing guidance to address the gap between the current guidance for heat-only and for air pollutants only. I want to know when to alter my behavior regarding outdoor activities, travel and exercise when my region experiences an event where temperatures are high and when the air quality is poor, from a wildfire or from another source. I want to know that my local community members are protected; especially it's most sensitive members (children, the elderly, those with chronic disease and those without access to air conditioning or viable indoor space).

Pre-existing guidance

The following documents currently exist to guide public health decision-making.

- For heat: Cal E.M.A.'s Contingency Plan for Excessive Heat Emergencies
- For fine particulates: Wildfire Smoke: A Guide for Public Health Officials
- For ground-level ozone: Recommendations for Schools and Others for Ozone
- For both fine particulates and ground-level ozone: the Air Quality Index

Options for moving ahead

CARB can take the following actions:

1. *Immediately identify a primary person within their agency to select members for an interagency working group*
2. *Defer all actions to another agency, such as the California Department of Public Health or to the National Oceanic and Atmospheric Association*
3. *Elevate the concern to the United States Environmental Protection Agency*
4. *Issue a statement to local health departments across the state that they should develop their own guidance, and why*
5. *Do nothing*

Advantages to making guidance

Epidemiological studies have shown that when guidance is available and accurately and effectively disseminated, illness and death are avoided. To decrease the public health burden from combined heat and air quality events, guidance addressing both elements needs to be establish and used by local communities. Local communities then have the responsibility of purposefully educating their communities of their risk to heat and air pollution exposure and what they need to do to protect their health given specific circumstances.

Final recommendation

The California Air Resources Board should identify a primary person from within their agency who has interagency collaboration inherent to their daily job function to identify and select an interagency working group to formalize the combined heat and air quality event guidance I started as part of my current project. This interagency working group should utilize and build upon the resource database that I developed as part of my project. This working group shall consult with US EPA professional, Susan L. Stone concerning the appropriate use of the Air Quality Index. Other professionals listed above should be strongly considered. These actions should happen immediately in order to maintain momentum after this years' heat wave and fire season.

Sources Cited

Please see the following database for all sources used to develop this policy brief and were utilized throughout the duration of the current project:

https://docs.google.com/spreadsheet/ccc?key=0Ato0DwyHmsyRdEI1WjhvQnJMTHQ3Q2FGRWU1YVBFZ2c

My Charge To All Of You

- Get involved
  - Join the interagency working group
  - Add resources and references to the Google database
  - Stay connected with others doing work in this field
  - Advocate for guidance in your own communities as citizens

If you have questions on how to do this…ASK ME!!!!!

Questions/Comments?

Rachel Aumann, MSW, MPH

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650.776.6096

Missed Some of the Webinar?

Not to worry…it will be posted HERE…

www.arb.ca.gov/carpa

THANK YOU

Shelley DuTeaux, ARB
Deborah Bennett, UC Davis
Greg Vlasek, ARB
Alberto Ayala, ARB
Mike Miquel, ARB
Joe Arsenith, Placer Co PH
Mike Romero, Placer Co PH
Lori Kobza, Sac Metro AQMD
Ann Hobbs, Placer Co APCD
Heather Kuklo, Placer Co APCD
Mike Fitch, Placer Co PIO
Susan Stone, US EPA
Svetlana Smorodinsky, CDPH
Todd Morris, NOAA
Placer Co Superintendent's Office
Eureka Unified School District
Roseville Joint Union High School District
Helene Margolis, UCDMC
CARPA
ERMaC
CalE.M.A.